

# DOE NEWS

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## **Packing Away the Past: INEEL Develops D&D Simulation Software**

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FOR IMMEDIATE RELEASE Packing up -it's a scenario that is familiar not only to travelers, but also to people dismantling and razing outdated nuclear research buildings. However, instead of suits, shoes, and toiletries crammed into suitcases, decontaminating and decommissioning (D&D) personnel routinely deal with packing a building's potentially radioactive and contaminated piping, tanks, pumps, and other equipment into waste boxes.

Engineers and programmers at the Department of Energy's Idaho National Engineering and Environmental Laboratory have developed a software program to optimize the cutting and packaging of debris resulting from D&D operations. The Decontamination, Decommissioning, and Remediation Optimal Planning System (DDROPS) is a simulation software program which allows an operator to simulate a facility for remediation preplanning and waste minimization purposes. Engineer Kevin Kostelnik is presenting a paper on this technology at the American Nuclear Society meeting in Pittsburgh on April 27th.

The INEEL development team, which includes engineers Richard Meservey, Mike McKellar and Kostelnik, realized simulation programs, commonly used in the shipping and aerospace industries, could be modified and applied to D&D activities. Starting with Parametric Technology Corporation's Pro/ENGINEER® software, the researchers developed an optimization feature to model a facility, identify optimal cut locations, the order of the cuts, and the placement of the resulting debris within waste boxes.

The process begins by building a computer-generated model of the facility using existing Computer-aided Design (CAD) files, blueprints, as-built drawings, photographs, laser scanning, and manual techniques. Information such as radiation levels, material composition, or weight can also be included.

The resulting model is available as both two- and three-dimensional representations. The two-dimensional model can show discrepancies between the As-built drawings and the current facility configuration. The three-dimensional model can be used for training purposes to familiarize D&D personnel with the facility without having them entering it and being exposed to hazards such as radiation and contamination.

"It's the training area that industry is excited about," said engineer Richard Meservey. "Having a training tool that shows people the hazards associated with a facility before they enter it is much safer."

Once a model of the facility is completed, a series of algorithms can be run to determine the best location for making the necessary cuts to remove components such as pipes, valves, and tanks. Having the computer show where to make cuts is more efficient and eliminates the need for workers to make additional cuts once the equipment is out of the building and being loaded into waste boxes.

"It's extremely frustrating trying to fit an 8 ft 1in. piece of piping into an 8 ft waste box," said Meservey. "We're trying to eliminate secondary cuts which will minimize personnel exposure as well as optimize the space available within the waste boxes."

Filling waste boxes as full as possible and eliminating void space is important in D&D operations. Like a haphazardly packed suitcase, poorly packed debris isn't efficient and increases costs.

"Twenty to thirty percent of the cost of a decommissioning project is associated with the disposal of the waste," Meservey said. "With waste boxes costing around \$600 and disposal costs now sometimes reaching a few hundred dollars a cubic foot, the fewer the boxes, the better."

DDROPS has been tested at the INEEL in conjunction with active D&D operations. The Central Facility Area Sewage Treatment Plant located on the INEEL site was a two-story solid concrete building with hazards such as potentially contaminated sludge and water in the basement, a roof of asbestos containing material, asbestos pipe lagging and roof pipe vents with lead flashing. Radiological hazards were also present.

Actual disassembly of the sewage treatment plant was performed manually, providing a baseline for comparison against DDROPS simulations. This testing was a success, proving DDROPS has several advantages over traditional disassembly methods.

Most of the advantages have to do with the ability to do more accurate up-front planning. This leads to reduced radiation exposure risk to workers, minimized waste volumes and disposal costs, updated As-built drawings, and more closely calculating the amount of debris that will be generated and comparing it with shipping constraints to minimize shipping and disposal costs.

"Historic preservation is an additional benefit of DDROPS," said Meservey. "The state historic preservation officer, who approves all D&D projects, wants a complete file of all historically significant buildings. DDROPS can provide a complete database of the building."

The researchers plan to use DDROPS this year to simulate and plan the dismantling of the Advanced Reactivity Measurements Facility located at the Test Reactor Area on the INEEL site. Funding for DDROPS was provided by INEEL discretionary research funds and software testing was funded by DOE's Office of Environmental Management (EM-50). The Idaho National Engineering and Environmental Laboratory is operated for the U.S. Department of Energy by Lockheed Martin Idaho Technologies Company. The INEEL celebrates its 50th anniversary this summer. --INEEL-- Media contacts:

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Note to Editors: Additional information on DDROPS as well as photos are available from Richard Meservey, 208-526-1834, [rhm@inel.gov](mailto:rhm@inel.gov).